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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/582,049	09/18/2000	Marcel Garnier	GARNIER-1	6845

7590  
09/10/2002  
Arthur L Plevy  
Buchanan Ingersoll  
4th Floor  
650 College Road  
Princeton, NJ 08540

EXAMINER

NGUYEN, NGOC YEN M

ART UNIT	PAPER NUMBER
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1754

10

DATE MAILED: 09/10/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/582,049

Applicant(s)

GARNIER ET AL.

Examiner

Ngoc-Yen M. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 June 2002.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-4 and 7-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11 and 12 is/are allowed.
- 6) ☒ Claim(s) 1-4 and 7-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All   b) ☐ Some \*   c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: *irradiated mail*.

### DETAILED ACTION

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-4, 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yuge et al (5,182,091) in view of DE 29 24 584.

Yuge '091 discloses a method for purifying silicon which comprises directing a plasma jet of an inert gas toward the surface of molten silicon held in a container lined with silica or a silica based refractory and stirring said molten silicon, said inert gas being mixed with 0.1-10 vol% steam (note claim 1). Yuge '091 discloses that it was found by small scale experiments that the adequate stirring of molten silicon reduces the loss of silicon below 10% during the purification process even though the amount of

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steam added to the plasma gas is increased to 10 vol%. Thus the stirring of molten silicon is essential. A better result is obtained when induction heating is applied to the molten silicon (note column 3, lines 37-44). Thus, Yuge '091 fairly teaches that induction heating is carried out not only to melt the silicon but also during the plasma treating step to improve the stirring of the molten silicon.

Yuge '091 discloses that although the process employs a plasma torch, which generates an arc therein, it is possible to make modification by applying the voltage across the plasma torch and the molten silicon (note column 3, lines 1-4).

The difference is Yuge '091 does not specifically disclose plasma, which is generated by an inductive plasma torch.

DE '584 discloses a process of producing silicon for solar cells by introducing silica or Si with a higher degree of contamination into a reducing gas atmosphere in a plasma. The plasma is preferred to be an inductive plasma instead of an arc torch in order to avoid contaminating the molten silicon (note English abstract and page 4, last full paragraph).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made use an inductive plasma instead of an arc plasma, as suggested by DE '584, in the process of Yuge '091 because the use of the inductive plasma would avoid contaminating the molten silicon.

Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yuge '091 in view of DE '584 and Hiratake et al (4,048,436).

Yuge '091 and DE '584 are applied as stated above.

Yuge '091 fairly teaches the inductive crucible and DE '584 the inductive plasma torch. Yuge '091 also disclose a bottom opening 13 (note Figure 4). The silica 1a in the bottom opening 13 is kept cooled and solidified, and it permits the electric current to flow to the water cooled electrode. This considered the same as the claimed electromagnetic valve.

The difference is Yuge '091 does not disclose a removable magnetic yoke between the plasma torch and the crucible.

Hiratake '436 discloses that an inductively produced plasma can be enlarged by subjecting the plasma to the rotating magnetic field generated by the rotating magnetic field generating means 44e. Because the plasma is more heated at its surface rather than its interior by induction heating on account of the skin effect, the rotating magnetic field has an effect to heat the surficial portion rather at a low temperature by its nature besides the enlargement of the plasma. This effect further contributes to the homogeneous heating of the plasma (note Figure 10 and column 6, lines 24-55).

For the "for inverting a stirring direction of the silicon load" limitation, when this limitation is considered as a "means plus function" limitation, and based on the instant disclosure, such means is required to have a specific shape and property (i.e., a ring shape magnetic yoke), thus, the magnetic ring shape means "44e" (as shown in Figure 10) of Hiratake '436 is considered as the required means for inverting the stirring direction. Alternatively, since the means in the instant claim 9 already is required to have the ring shape yoke and being magnetic, the limitation "for inverting a stirring

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direction” is considered as an intended use limitation. Such limitation is given little weight, In re Hack 114 USPQ 162. Furthermore, since the magnetic ring shape means as disclosed in Hiratake '436 has all the positive limitations as those of the required means, it would be capable of performing the same function.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made enlarge the plasma in Yuge '091, by using a rotating magnetic field, as suggested by Hiratake '436, because an enlarged plasma with a wide and homogeneous temperature distribution can be obtained and the wider the plasma the more surface it can treat.

Applicant's arguments filed June 19, 2002 have been fully considered but they are not persuasive.

Applicants argue that Yuge '091 teaches that the use of plasma jet configuration is used to “prevents the entrance of impurities into silicon from the plasma torch”, therefore, one skilled in the art would not be motivated to go to the DE '584 reference.

Applicant's argument is not persuasive because even if the process, as disclosed in DE '584 for avoiding contaminating the molten silicon, does not have significant advantages over the process of Yuge '091, the two processes are still considered as two analogous processes. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to replace one process with another analogous process in order to achieve the same intended results.

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Applicants argue that the reference does not teach the use of a “cold crucible” and the “turbulent” stirring.

In the references, there is no disclosure of preheating the crucible; therefore, it is reasonably assumed that the crucible is “cold”, i.e., not preheated. For the “turbulent” stirring, Yuge '091 fairly teaches the desire of “turbulent” stirring by disclosing the desire to intensify the stirring (note column 3, lines 14-15).

Applicants argue that Yuge '091 discloses a hot crucible lined with silica (column 2, lines 19, 24).

Yuge '091 does disclose a container (i.e., crucible) line with silica, however, there is disclosure of preheating the container before receiving the silicon. It should note that the instant claims do not exclude the presence of the inductive heating means (4) as shown in Figure 1 of Yuge '091 (note induction coil 12 in Figure 1 of the instant application).

Applicants argue that the claimed electromagnetic valve uses a configuration having a coil 51, surrounding the output aperture and imbricated in the low portion of the crucible with coil 12 of the actual crucible.

In Applicants' claim 10, neither coil nor any other structure is required. For the reason stated in the above rejection, the opening as disclosed in Yuge '091 is considered the same as the claimed “electromagnetic valve”.

Applicants argue that the claimed magnetic yoke has the purpose of “inverting a stirring direction of the silicon load”; not for deflecting the plasma jet as disclosed in Hiratake '436.

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This argument is not persuasive for the same reasons as stated in the above rejection.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (703) 308-2536. The examiner is currently on a Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (703) 308-3837. The fax phone numbers for the organization where this application or proceeding is assigned are (703)



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872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



Ngoc-Yen M. Nguyen  
Primary Examiner  
Art Unit 1754

nmn  
September 9, 2002